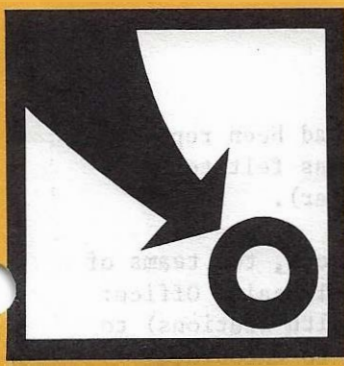


1 Oct 1976



# SMALLPOX TARGET ZERO

## the last known case

### ETHIOPIA: DEVELOPMENT OF THE PROGRAMME SINCE 1971

1971

The Smallpox Eradication Programme in Ethiopia began in January 1971, fully two years later than the commencement of programmes in other endemic countries. The delay resulted from the fact that health resources were so heavily committed to a malaria eradication programme which was experiencing so many difficulties that Ethiopian health officials were reluctant to commence yet another eradication programme. An agreement to undertake smallpox eradication was reached on the understanding that Ethiopia's contribution would be limited to the salaries of 20 health officers and sanitarians, if they could be found, and nothing more. Available WHO funds at that time were limited because of heavy commitments to other programmes in Asia, Africa and South America. Efforts to find bilateral support failed to obtain cash donations but the United States Peace Corps did agree to provide initially 17 volunteers. Vaccine already being supplied to WHO's Voluntary Fund was sufficient to cover Ethiopia's needs for vaccine. Efforts to borrow vehicles from other Ethiopian programmes met with no success. Thus the campaign was begun with only 21 vehicles and a field staff of 34. Some US\$120,000 in WHO funds were provided for local operating costs.

The available resources were few indeed to cope with smallpox in a population of some 24 million persons living in a country of 1,222,000 square kilometers (472,000 square miles) - equivalent in size to France, the Federal Republic of Germany, the German Democratic Republic, Denmark and the Benelux countries. But the problems were more than size alone. More than half the population is said to live at least one day's walk from any accessible road; telephone and telegraphic communications were seldom found outside of provincial capitals; of some 14,000 national health staff of all categories, more than 11,000 were engaged in the malaria programme and none could be spared for other duties. The rugged, central and north-central plateau which constitutes one-third of the country and where one-half of the population lives is criss-crossed with gorges and surmounted by mountains rising to more than 4,000 meters. The plateau population does not live in villages but rather, in small groups of houses (tukuls) scattered across the countryside. The rest of the country consists largely of scrub desert inhabited by constantly moving nomad bands. Last, but not least, the people living on the plateau strongly objected to vaccination and routinely engaged in variolation. This ancient practice consists in innoculating a susceptible person with pustular material from a case. Although the recipient is usually less seriously ill than when naturally infected, he can spread smallpox to others and thus cause further spread of the disease. Little smallpox vaccination had been done in Ethiopia and studies during the course of the programme showed that vaccination immunity throughout the country in January 1971 was about 5 per cent.

Between 1957 and 1970, an average of only 471 smallpox cases each year had been reported but as a reporting network was virtually non-existent, the true figure was felt to be as much as 50 times greater than this (an underestimate as was found later).

The plan of the programme was to establish in each of the 14 provinces, two teams of 2 to 3 persons, each with a vehicle, who would work out of the Provincial Health Office: 1) to contact all health units (64 health centres, 84 hospitals, 531 health stations) to promote weekly reporting of smallpox, to distribute vaccine to them and to encourage maximum possible cooperation in vaccination; 2) to investigate and contain all reported outbreaks; 3) in the absence of cases or when unable to travel into the countryside during the summer rainy season, to vaccinate along main roads, in markets and in such urban areas as existed. However, as available resources were so limited, the prospects were not hopeful for early eradication, if in fact it could be achieved at all.

By July 1971, activities of some sort were in progress throughout the country but the principal efforts were directed to the south-western provinces which bordered smallpox-free Kenya and virtually smallpox-free Sudan; to Addis Ababa, which as an urban centre, could be expected to serve as a source of spread of smallpox throughout the country; and to Eritrea where health resources were more plentiful and the transportation network far better developed.

As the programme got under way, it was soon discovered that smallpox was far more prevalent than any had surmised. In searching for smallpox, the surveillance officers had been trained to go to the schools, to show the WHO smallpox recognition card and to ask about cases. One surveillance officer working in Kaffa Province remarked afterwards that by the time he had visited one school room to inquire about cases, he already had a longer list of suspect areas than he could reach during the following month. In many instances the outbreaks were so plentiful that containment had to be performed on an area-wide basis. In the same way that one might combat a forest fire, teams travelled to the outer-most limits of an outbreak area and commenced vaccination in a belt around the infected area, hoping that the outbreaks within the circle would eventually die out by themselves.

During 1971, 26,329 smallpox cases were documented (Table 1), a figure considered to be less than 10 per cent of all cases which had occurred that year. By the end of 1971, 3,385,600 persons had been vaccinated (Table 2).

Unexpected was the discovery that throughout Ethiopia smallpox was more mild than was seen elsewhere in Africa. The reasons for this are still unknown. Patients had fewer lesions and generally were less ill. Among the 26,329 cases, only 530 had died (2.1 per cent). This compares to case-fatality rates of 5 to 15 per cent observed elsewhere in Africa. A problem inherent in the mildness of the disease was the fact that patients in the rash phase of disease did not feel particularly ill and so travelled widely spreading smallpox among contacts. The considerable distances which Ethiopians regularly travel on foot was emphasized when, in 1971, a smallpox patient driving a herd of cattle travelled almost 300 kilometers on foot in 14 days, introducing the disease into Kenya. Vaccination in the southern provinces was enthusiastically accepted almost everywhere but not among those living on the highland plateau except when a death had occurred - but there were few of these.

## 1972

By January 1972, the field staff had increased to 29 sanitarians and 24 U.S. Peace Corps volunteers with 26 vehicles. In June, 4 members of the Austrian Volunteer Service joined the programme and, later, the Japanese Overseas Cooperation Volunteers provided eight surveillance officers, four mechanics, two radio technicians, five cross-country vehicles and 15 radio stations. By the end of the year, the staff had increased to 75 persons with 50 vehicles.

With additional staff, activities were able to be intensified throughout the country. Although reporting was far more complete than during 1971, the number of cases decreased from 26,329 to 16,999. Nearly 20 per cent of all cases were reported by the existing health facilities, the balance being found by surveillance teams. During the year a further 3,200,000 persons were vaccinated. Most encouraging was the interruption of smallpox transmission in the northern provinces of Eritrea (June 1972) and Tigre (November 1972) and the two south-western provinces of Illubabor (March 1972) and Wollega (May 1972). However, in Begemdir and Gojjam, which together reported 4,600 cases, progress was discouraging. Variolation was found to be rampant and accounted for over one-third of all cases. In December 1972, it was forecast that these would be the last endemic areas in the country.

### 1973

Although still with a staff of less than 100 persons, substantial progress was made and the number of cases decreased by 68 per cent to 5,414. More staff could be concentrated in the decreasing number of infected areas and, thus, more complete case detection and containment was possible. Increasing assistance was received from national staff engaged in national leprosy, malaria and tuberculosis programmes. Although only one southern province interrupted transmission (Gemu Gofa in April 1973), smallpox incidence in all provinces decreased substantially. Addis Ababa recorded only 53 cases, all of which were due to importations. However, a serious disruption to the programme occurred in the northern province of Wollo where severe drought and famine were accompanied by migration and the spread of smallpox throughout this and adjacent provinces. Importations occurred into smallpox-free Eritrea and Tigre but these were rapidly detected and contained.

### 1974

With a steadily declining incidence in the southern provinces, the strategy for 1974 called for a greatly intensified effort in the problematical central and northern highlands as well as the adjacent desert areas. Neighbouring countries volunteered their assistance. In January, Sudan provided a team of 14 men and 3 vehicles to search and vaccinate the western part of Gojjam Province. Also that spring the French Territory of the Afars and Issas sent 45 men with 20 vehicles and 3 helicopters to search and to vaccinate throughout the Danakil desert within a radius of 200 kilometers from the borders of the Territory. Kenyan teams vaccinated along the southern Ethiopian border. Additional assistance was offered by the United States Public Health Service which in November provided two helicopters in support of Ethiopian teams in Gojjam, Begemdir and Wollo Provinces. For the first time that year, a campaign in the more inaccessible, highland rural areas was continued throughout the summer rainy season. Difficult though this was, the results were encouraging as smallpox incidence during the last 12 weeks of the year fell considerably below that of the year before. During 1974, smallpox incidence declined for the third consecutive year, a decrease of almost 20 per cent to 4,439 cases. Two additional southern provinces interrupted transmission (Kaffa in April and Sidamo in October). However, progress was not so great as had been hoped as many transitional difficulties occurred as a result of a change of government, and activities were periodically disrupted in many areas, sometimes for extended periods. By the end of 1974, the endemic areas were primarily confined to the highland plateau areas of Gojjam, Begemdir, Wollo, Shoa and Hararghe. There, due to population resistance to vaccination plus the prevalent practice of variolation, progress was far slower than had been hoped.

### 1975

The tempo of activity gradually increased throughout 1975 as additional WHO funds were diverted to Ethiopia. Until 1975, Asia with its far more lethal variola major was considered to be of first priority. However, with the interruption of transmission of smallpox in Pakistan in October 1974, in Nepal in April 1975, in India in May 1975, and

in Bangladesh in October 1975, increasing funds and manpower were able to be diverted to Ethiopia. With assistance from the U.S. Public Health Service helicopter support was continued throughout the year and increased from two to four planes in late autumn. Additional cross country vehicles and camping equipment were provided and funds were made available which permitted local villagers to be hired and trained for surveillance and vaccination activities. Ethiopian students were assigned that year for development work in the countryside and many assisted the smallpox programme. Additional WHO advisers were assigned and the number of Ethiopian staff grew steadily from approximately 100 in January to 1,000 in December. With contributions provided to WHO's Voluntary Fund, the budget increased almost three-fold - from some US \$850,000 in 1974 to US \$2,243,000 in 1975. During 1975, U.S. Peace Corps volunteers withdrew from the country and Austrian volunteers also departed at the end of their assignments but Japanese volunteers continued to serve. Two of the administrative regions in the highland plateau succeeded in interrupting transmission (Wollo in September and Shoa in December). Smallpox incidence decreased by a further 10 per cent to 3,935 cases. Over half of all the cases (2,222) were in Gojjam. By December, the endemic areas had been reduced dramatically. Remaining were limited areas of Gojjam and Begemdir which bordered the difficult and frequently uncooperative populations who lived in and near the Blue Nile Gorge and an area in the mountains of Hararghe which had been infected by nomads during the summer and not detected until November. In addition, cases continued to be detected among nomads in the south-eastern Ogaden desert - an area so sparsely populated that it was difficult to understand how smallpox could persist with even modest containment and vaccination efforts. Complicating the situation was drought throughout the Ogaden desert area and an increased movement of nomads seeking water wherever it could be found and food from emergency relief shelters. While progress was made, it was again less than what had been hoped. Work in a number of areas of the country had to be interrupted periodically due to local conflicts; a helicopter was destroyed by a hand grenade and another destroyed in a crash caused by mechanical problems; and there were frequent difficulties with provision of petrol and spare parts in many areas.

#### 1976

Largely because of a grant of some US \$3,000,000 from the USA, the intensive efforts of 1975 were continued and the tempo further increased throughout the year. The number of Ethiopian staff increased further to more than 1,200 and an additional helicopter plus a fixed-wing aircraft were eventually made available. With the manpower available it was possible in all outbreaks to post guards at each infected house to prevent the patient from leaving and to ensure vaccination of all who visited; all residents in an infected area were able to be registered for vaccination; drugs were provided to teams for administration to villagers as a further inducement to accept vaccination; and extensive systematic search over large areas was able to be undertaken. The interest of the new revolutionary government in extending health programmes into the rural areas and the formation of Farmers' Association Cooperatives benefitted the programme in many areas as it was now possible to contact more easily the local people and to persuade them to cooperate with the teams. Conversely, however, in a few endemic areas resistance by traditionally conservative people seriously hampered the programme.

The endemic areas rapidly decreased to one in the north straddling the Blue Nile Gorge and a second embracing the far-flung nomadic areas in the Ogaden desert. Finally, on 5 July the last case in the highland areas was detected and contained. Despite extensive continuing search, no further cases were found. In the desert, the strategy consisted of containment of known outbreaks, vaccination of all nomads visiting water-holes and settled areas and systematic vaccination of settled populations living along the major Wabi-Shebale river and around the El Kere area in Bale Province. Again, unexpected problems were encountered when the most serious flood in decades occurred on the Wabi-Shebale, destroying roads and airplane landing strips. In Bale, especially, but in a few other areas, roving groups of bandits ('shiftas') caused work in such areas to be suspended for weeks to months at a time. Intensive search has now been extended throughout the Ogaden desert and into



TABLE 1. ETHIOPIA - SUMMARY SHEET  
CASES OF SMALLPOX

Admin. Region	Pop. <sup>1</sup> (000)	1971	1972	1973	1974	1975	1976	Last known endemic case	
North									
Begemdir	1603	3156	2173	511	677	175	512	July	1976
Eritrea	1894	487	86	3	-	-	-	June	1972
Gojjam	1590	734	2427	1044	1735	2222	85	March	1976
Tigre	1689	1264	674	17	30	-	-	November	1972
Wollo	1974	982	1145	854	713	488	-	September	1975
Southeast									
Arussi	851	452	116	10	40	54	9	January	1976
Bale	684	728	74	35	53	6	62	August	1976
Hararghe	2440	1261	1942	1327	711	465	247	July	1976
Sidamo	2190	2363	2530	262	87	-	-	October	1974
Southwest									
Gemu Gofa	782	2420	1248	7	-	-	-	April	1973
Illubabor	612	3049	19	-	-	1	-	March	1972
Kaffa	1260	5024	3034	308	73	-	-	April	1974
Shoa	4127	1884	1065	1034	320	524	-	December	1975
Wollega	1577	2525	466	2	-	-	-	May	1972
Total		26329	16999	5414	4439	3935	915		

<sup>1</sup> Population estimates as of 1 January, 1974.

TABLE 2. VACCINATIONS PERFORMED - ETHIOPIA (THROUGH JUNE, 1976)

Admn. Region	1970-1971	1972	1973	1974	1975	1976(June)	Total
Arussi	52600	53300	17700	36700	184800	91600	436700
Bale	59900	52400	36000	45400	13200	11100	218000
Begemdir	146500	255400	84700	56800	58200	27800	629400
Eritrea	287900	198500	52400	4700	4500	6000	554000
Gemu Gofa	274600	188400	40600	76700	11700	12500	604500
Gojjam	53000	137100	173300	289200	391300	386600	1430500
Hararghe	113400	309200	333800	351600	320100	1209300	2637400
Illubabor	241200	196400	59800	77700	35400	38600	649100
Kaffa	488800	561500	99000	107500	29700	11700	1298200
Shoa	832800	423500	459600	152500	233700	286100	2388200
Sidamo	270600	344400	206500	134900	127000	33900	1117300
Tigre	134000	150600	86300	117300	104100	16400	608700
Wollega	339400	272700	126400	34100	33700	3000	809300
Wollo	90900	78800	233100	566400	200400	298500	1468100
Total	3385600	3222200	2009200	2051500	1747800	2433100	14849400

TABLE 3. ENDEMIC STATUS OF ADMINISTRATIVE REGIONS  
(PROVINCES) BY YEAR\*

Admin. Region	1971	1972	1973	1974	1975	1976	Last known endemic case
Begemdir	X	X	X	X	X	X	1976 - July
Gojjam	X	X	X	X	X	X	1976 - March
Hararghe	X	X	X	X	X	X	1976 - July
Bale	X	X	X	X	X	X	1976 - August
Eritrea	X	X	I	O	O	O	1972 - June
Tigre	X	X	I	I	O	O	1972 - November
Wollo	X	X	X	X	X	O	1975 - September
Arussi	X	X	X	X	X	X	1976 - January
Sidamo	X	X	X	X	O	O	1974 - October
Gemu Gofa	X	X	X	O	O	O	1973 - April
Illubabor	X	X	O	O	I	O	1972 - March
Kaffa	X	X	X	X	O	O	1974 - April
Shoa	X	X	X	X	X	O	1975 - December
Wollega	X	X	I	O	O	O	1972 - May
Total endemic	14	14	10	9	7	5	

\* X - Endemic at some time during year

I - Imported cases only

O - No known cases



ETHIOPIA - ADMINISTRATIVE REGIONS

